

## **Impact of Computer Self-Efficacy and Computer Anxiety: A Practical Indicator of Dental Students' Computer Competency in Sri Lanka**

Champa N. K. Alahakoon<sup>1</sup>

### **Abstract**

This study identified the impact of computer self-efficacy (CSES) and computer anxiety (CARS) of dental students at University of Peradeniya Sri Lanka. The sample consisted of a total of 129 undergraduates from two academic years that are 2<sup>nd</sup> and 3<sup>rd</sup> years at the Dental Faculty during the second semester in the months of August to December of 2012/2013. Of total sample 77% responded. The Murphy et al.'s CSES was used to determine computer self-efficacy whereas Heinssen et al.'s CARS scale was used to determine computer anxiety of undergraduates. The results indicated that both 2<sup>nd</sup> and 3<sup>rd</sup> year undergraduates were self-efficacious. Subjects showed 50 percent of computer anxiety which is moderate level to use computers. Although there were no significant differences among self-efficacy, anxiety, studying year and Z-Score, there was a significant differences shown in age and gender based on frequency of library use. Results of the correlation indicated that studying year and age of the undergraduates have strong and high correlation. The results would be useful to the course designers and dental library staff to redesign of the Information Literacy program based on studying year and age. Furthermore, the hands-on-training of the program would be more effective for further reduction of the anxiety.

**Keywords:** Computer Self-efficacy, Computer Anxiety, Dental Students, Self-efficacy Theory, Literacy program.

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<sup>1</sup> Senior Assistant Librarian, University of Peradeniya, Sri Lanka.  
Email: kumaria@pdn.ac.lk

## **Introduction**

The university library is a most important institute in the detection of academic distinction in the university system with proliferated Information Technology. Today the library system of University of Peradeniya in Sri Lanka is moving away from the role of being the curator of traditional information resources to being the disseminator of service-oriented electronic information resources.

The ICT developments have considerable impact on the educational and learning structures that have traditionally facilitated learning (Sam, Othman, & Nordin, 2005). Recent developments in information technology and the dispersion of personal computers, the development of library software, multimedia, and network resources sprung over the last decade indicate the expansion and implementation of new and modern teaching strategies.

Within a span of twenty years (1990-2010) the Peradeniya university library system had introduced computers with the Internet, e-mail and other software and hardware facilities for the fulfillment of user's information needs. Not only that, the web sites of the academic library usually provide link to access to web accessible research databases and full-text e-journals to its user community. To handle these computer technologies and web accessible resources, the undergraduates should be efficacious in the computer and Internet that have to be acquired by them.

## **Contextual Background**

In 1997, the dental faculty library was merely a Reading Room with a small collection of books for students however, it was later established in to a new library in 2008. Although, there are 15 UGC-governed universities in the country of Sri Lanka, this is the only University which supports the Dental Sciences discipline through the Dental faculty in the country. Therefore, this faculty has an urge to establish the subject related library within the faculty premise and it was fruitful in the year of 2008 July with approximately 1000 library materials.

As the usage of current information in the field of Health Sciences is rapidly increasing, the library management and the Faculty of Dental Sciences have collaboratively decided to introduce an Information Literacy (IL) skills program to their undergraduates. The aim of this program was to improve the ICT literacy to get the maximum use of electronic information resources available in the library and to computer minimize the anxiety if any when using computers. To ensure the extensive use of information, it is necessary to identify the computer self-efficacy level of the Dental undergraduates. This gives the practical exposure to identify whether they are efficacious to use electronic resources in the Library.

### **Conceptual background**

Bandura's work on self-efficacy has been relatively influential, with a major work being published recently (Bandura, 1997). Further self-efficacy can be measured in particular area or subject, and it has been measured in relation to computing and Internet too. According to Bandura, (1997), self-efficacy is the belief "in one's capabilities to organize and execute the courses of action required to produce given attainments". Wood & Bandura (1989) expanded on this definition by suggesting computer self-efficacy can be seen as a measure of an individual's judgment of their own abilities with computers, an assessment of self-confidence. Miura (1987) has mentioned that self-efficacy may be an important factor related to the gaining of computing skills and computer self-efficacy is an exact type of self-efficacy.

Kinzie, Delcourt & Power (1994) defined self-efficacy as an individual's self-confidence or self-judgment in his or her capability, which may impact the performance of tasks;

“Efficacy, expectancy, also known as self-efficacy, reflects an individual's confidence in his/her ability to perform the behaviour required to produce specific outcomes and is thought to directly impact the choice to engage in a task, as well as the effort that will be expended and the persistence that will be exhibited” (Kinzie, Delcourt, & Power, 1994, p. 747).

Eastin and LaRose (2000) mentioned self-efficacy as a form of self-evaluation or judgment that influences assessment about what behaviours to

assume, the amount of attempt and determination put forth when faced with obstacles. Self-efficacy does not measure the skills but it measures what individuals believe they can do with the skills they have.

Computer anxiety was defined as “fears concerning the computer itself, that is, jargon, technological trends, the ‘paperless society’; worries about damaging the computer; the showing an inability to type” offered by Ovens (1991, p.86). Feelings of anxiety nearby computers are predictable to negatively influence to use computers. It is not surprising that people are expected to keep away from behaviour that hoists anxious feelings. Many studies (Anthony, Clarke, & Anderson, 2000, Compeau & Higgins, 1995, Compeau et al., 1999, Durndell & Haag, 2002, Thatcher & Perrewew, 2002, and Sam, Othman, & Nordin, 2005) have demonstrated a positive or negative relationship between computer anxiety and the use of computers. When people are with high computer anxiety, their performances might be poorer than those with less or no computer anxiety.

### **Purpose of the research**

The aim of this research study was to examine the level of impact of computer self-efficacy and computer anxiety among dental undergraduates of Peradeniya Sri Lanka. Specifically with this objective the study looks into the following research questions:

1. What are the levels of computer self-efficacy and computer anxiety of dental undergraduates?
2. Are there gender differences in computer self-efficacy and anxiety levels of these students?
3. Are there differences in computer self-efficacy and computer anxiety based on frequency of library usage of these undergraduates?
4. Are there differences in studying year, Z-Score and age based on frequency of library usage?
5. Does any correlation exist between the related factors and computer self-efficacy and computer anxiety?

## **Literature Review**

Today the library has become a dynamic combination of information technology with communication technology. Although, there are many computer related technologies in libraries, specially the electronic information resources, online public access catalogues (OPAC), CD-ROM products, online databases; one of the main problems inbuilt with these is the minimized access to information for those who are unable to use computer technology and the fear to use it in a proper manner (Jerabek, Meyer & Kordinak, 2001).

A number of studies have revealed the effect of computer self-efficacy and computer anxiety on computer related behaviours. Weil, Rosen & Sears (1987) mentioned that whatever the word either it is computer anxiety, techno stress or computer-phobia, all approximation pointed out that one out of three adults suffer from aversive reactions to computers and computer related technologies.

Kinzie, Delcourt, & Power (1994) identified the attitudes of computer technology and self-efficacy across undergraduate disciplines. They mentioned that attitudes significantly contribute to prediction of self-efficacy for computer technologies and those are accounted for demographic variables and computer experience. However, Levine & Donitsa-Schmidt (1998) pointed out that computer self-confidence and computer anxiety are basically the same thing.

Self-efficacy was found to play an important role in determining an individual's feelings and behavior (Compeau & Higgins, 1995). Compeau et al. (1999) mentioned that higher the individual's computer self-efficacy, lower the computer anxiety'. Neither, higher the individuals' computer anxiety, lower the use of computers. Ren (2000) proved that competency programs are effective to enhance the student performance. Therefore, this study relates much more to learning the intensity of computer self-efficacy of undergraduates and to know how to develop the user training programs to enhance the use of electronic information. Anthony, Clarke, & Anderson (2000) mentioned that negative correlation indicated that a person who has high computer anxiety would have more negative thoughts about using

computers. Technophobia was not correlated with gender in this study and a doable reason is that many more females who attend university and enroll in computing courses more than a decade ago. Like them, Thatcher & Perrew (2002) examined the relationship between computer self-efficacy (CES) and computer anxiety (CA) and it tries to link individual differences with CSE and CA. CA confirmed a direct, statistically significant, negative relationship with CSE thus, supporting CA will have a negative relationship with CSE. Other than these researchers there are number of studies indicated that the self-efficacy and anxiety among undergraduates have been consistently shown to have moderate to strong negative correlations (Barbeite & Weiss, 2004; Hauser, Paul, & Bradley, 2012; Eastin & LaRose, 2002; Khorrami-Arani, 2001; Sam, Othman, & Nordin, 2005; and Shu, Tu, & Wang, 2011). Chien (2012) examined that e-learning experiences was helpful to decrease computer anxiety and enhance computer skills which improve learners' confidence of using computers.

Many studies have considered gender as a variable to identify differences or similarities in their sample populations relating to computer self-efficacy and anxiety (Durdell, & Hagg, 2002; He, & Freeman, 2010; Sam, Othman, & Nordin, 2005; Simsek, 2011; Shu, Tu, & Wang, 2011). The research on gender and computing has more or less produced results, which indicated that larger male than female use of computers. Importantly, the amount of gender differences in many of these studies is often not large (Durdell & Hagg, 2002).

Correlations of the studies also have measured with many factors used within the studies and indicated that some of the factors correlated with high significance and some are not (Jerabek et al., 2001; Sam, Othman, & Nordin, 2005).

## **Research Methodology**

### ***Subjects***

A survey research method was used for the study. The undergraduate sample was obtained from the University of Peradeniya Sri Lanka and since their IL course had already been conducted only for 2 consecutive batches i.e.

2011/2012 and 2012/2013, the undergraduates who are in the 2<sup>nd</sup> and 3<sup>rd</sup> years were selected for the study.

### ***Sample***

According to Krejcie and Morgan (1970) sampling table, the required sample from two batches was (80+69=149) respectively. The overall response rate is 77% (114/149). According to the statistical tabulation of the sample, the majority of the respondents were females 77 (67.5%) and male respondents were only 37 (32.5%). Age distribution of these undergraduates indicated that minimum and maximum age range is 21-26.

### ***Material***

Closed ended questionnaire was self-distributed to collect data for this study. The questionnaire was consisted 3 sections. The first section covered, the demographic information, searching methods and frequency of library visits were collected.

The second section was the Computer Self-efficacy Scale which originally used by Murphy et al. (1989) and this scale mainly concern on prior self-efficacy research (Bandura, 1997). The 29 items were used with five point Likert type scale (1= Strongly disagree – 5= Strongly agree). The CSES was adapted in this research as it more closely reflected the nature of the basic computer skills of students (Eastin & LaRose, 2000) and have the opportunity to recall the basic skills taught in IL programme. According to the Likert scale, the highest scores indicated a high degree of confidence about one's ability to use computers and scores could range between 29 and 145.

The third section of the questionnaire was used to provide the Computer Anxiety Rating Scale (CARS) and was used to evaluate an individual's level of computer anxiety. The CARS is a 19 items self-report scale, developed and validated by Heinssen et al. (1987). Undergraduates responded on a five point Likert type scale (from 1=strongly disagree to 5=strongly agree). About the score of the scale it could range from 19 by indicating a low level and 95 would indicate a high degree of computer anxiety.

Hundred and fifty questionnaires were self-administered during the second semester in the months of August to December of 2012/2013.

### **Data analysis procedure**

Data tabulation was carried out by using the Statistical Package for Social Sciences version 13 and used frequencies, descriptive analysis, percentages, cross-tabulations, reliability, t-test, ANOVA, and Pearson's correlations, were performed to analyse the data.

### **Results**

The subjects for this study were 114 Dental Sciences undergraduates at the University of Peradeniya, Sri Lanka. Out of 114 sample 54 undergraduates from the second year and 60 undergraduates from the third year. A review of the demographic characteristics of the subjects is shown in Table 1.

**Table 1:** Demographic data of the dental undergraduates

<b>Demographic Variables</b>	<b>2<sup>nd</sup> year Undergraduates</b>	<b>3<sup>rd</sup> year Undergraduates</b>
Age	Mean =22.63; SD =.896; range 21-24	Mean =24.33; SD =.877; range 23-26
Gender		
• Female	38 (70.4%)	39 (65%)
• Male	16 (29.6%)	21 (35%)
Searching methods		
• Card Catalogue	51 (94.4%)	32 (53.3%)
• Electronic	1 (1.9%)	8 (13.3%)
• Both	2 (3.7%)	20 (33.3%)
Frequency of Library Use		
• Frequently	22 (40.7%)	40 (66.7%)
• Moderately	28 (51.9%)	16 (26.7%)
• Rarely	04 (7.4%)	04 (6.7%)

SD= Standard deviation

### **Reliability**

Since the scales used in this research were developed for foreign user categories the reliability of the CSES and the CARS scales was assessed to the Sri Lanka by using Cronbach's alpha and indicated year wise in Table 2.

Alpha level of the computer self-efficacy scale is higher in both years 2<sup>nd</sup> and 3<sup>rd</sup> year but the alpha level of computer anxiety rating level differs in these two years.

**Table 2:** Reliability and the alpha level of the two scales

Year	N	Scales and no. of items	Alpha	If single items were deleted minimum alpha
2 <sup>nd</sup> year	54	CSES - 29	0.943	0.938
	54	CARS - 19	0.577	0.542
3 <sup>rd</sup> year	60	CSES - 29	0.909	0.902
	60	CARS - 19	0.820	0.805

***The level of computer self-efficacy and the anxiety***

The level of computer self-efficacy was measured via descriptive statistics by year base to identify the efficacy level of the students. Since the two scales have different number of items (29 and 19) the levels of the students was measured by the item mean of each scale. Accordingly, the total score range for CSES it has 29 items and could be 29-145 or by item mean, it could be 1.03, 1.06, 1.10.. 4.9..145. For the CARS it has 19 items and would be 19-95 or by item mean, it could be 1.05, 1.10, 1.15, 3.84 ..95. The responses ranged from 1= Not at all confident to 5= Very confident. Table 3 shows the students' efficacy level for each scale, its percentage value, the mean scores, and the standard deviations.

**Table 3:** Efficacy and stress level of the dental undergraduates

University		CSES (145)*	Level %	CARS (95)*	Level %
2 <sup>nd</sup> Year	Mean	3.87		2.50	
	Std. Dev.	0.52		0.27	
	Minimum	2.93		1.8	
	Maximum	4.82		3.10	
<b>Mean * Number of items</b>		<b>112</b>	<b>77</b>	<b>47.5</b>	<b>50</b>
3 <sup>rd</sup> Year	Mean	4.08		2.54	
	Std. Dev	0.33		0.43	
	Minimum	3.37		1.89	
	Maximum	4.86		3.68	
<b>Mean * Number of items</b>		<b>118</b>	<b>81</b>	<b>48.26</b>	<b>50.8</b>

According to Table 3, the undergraduates' responses to the CSES, they showed high computer self-efficacy level in 2<sup>nd</sup> and 3<sup>rd</sup> years respectively 77% and 81%. The mean level of the scale indicated as 3.87 and 4.08. However, results showed moderate computer anxiety level in both year undergraduates and which is not exceeded 50% in each year.

***Gender differences in Computer self-efficacy and computer anxiety of undergraduates***

The study used the t-test to analysed the gender differences (Table 4) in the computer self-efficacy scale and anxiety scale.

**Table 4:** t-test results for differences based on gender

<b>Scales</b>	<b>Gender</b>	<b>N</b>	<b>t-value</b>	<b>df</b>	<b>P</b>
Computer Self-efficacy (CSES) 2 <sup>nd</sup> Year	Male	16	-.504	52	0.617
	Female	38			
Computer anxiety (CARS) 2 <sup>nd</sup> Year	Male	16	1.102	52	0.276
	Female	38			
Computer Self-efficacy (CSES) 3 <sup>rd</sup> Year	Male	21	-1.917	58	0.060
	Female	39			
Computer anxiety (CARS) 3 <sup>rd</sup> Year	Male	21	-.002	58	0.999
	Female	39			

With reference to Table 4, there were no significant differences in computer self-efficacy and computer anxiety based on gender in dental undergraduates. This was clearly indicated in p values of the table 4 and all the values are more than 0.05. Therefore, gender was not a significant factor, which influenced to achieve different computer self-efficacy level by the dental undergraduates in Sri Lanka.

***Differences between the Computer self-efficacy, computer anxiety and other related factors***

Library usage of the Dental undergraduate's was measured by providing four options relating to frequently, moderately, rarely and not use. The ANOVA was used to identify whether there was any difference based on the frequency of library usage and the computer self-efficacy and computer anxiety with other related factors. According to many researchers in the

literature survey has mentioned that the high usage of computers were helpful to minimize the anxiety of the users. To measure this argument, the following analysis was conducted in this survey.

**Table 5:** Analysis of One-way ANOVA for differences based on frequency of library usage

Measure scales	F	P
Computer self-efficacy (CSES)	0.478	0.621
Computer anxiety (CARS)	1.057	0.351
Studying Year	2.492	0.087
Z-Score	3.085	0.050
Age	5.490	0.005*
Gender	6.251	0.003*

Note: \*p<0.05

There was no significant difference in the frequency of library usage between computer self-efficacy levels and between computer anxiety levels in both 2<sup>nd</sup> year and 3<sup>rd</sup> year. Further, they did not have any differences according to their studying year too. Regarding the Z-Score of these undergraduates, both studying year showed marginal level significance by indicating 0.05. There was however differences in their age and gender among these undergraduates based on the frequency of use of dental library. All these similarities and the significant difference were indicated in Table 5.

***Correlation exist between the measures of CSES, CARS and other factors***

Correlations of the measured factors were calculated between the whole sample and shown in Table 6. According to that, studying year is the main factor, which correlates with every other factor in the correlation table. Studying year is significantly correlated with Z-score, computer self-efficacy and computer anxiety. Moreover, there is a correlation between age and the computer self-efficacy and all these were correlated at 95% confidence interval.

Although it was not indicated any significant correlation between studying year and the frequency of library usage, there was, however, a significant and strong relationship between studying year and the age. Moreover, another significant relationship was shown in studying year and the computer

self-efficacy level of the undergraduate. Gender also significantly correlated (0.316\*\*) with frequency of library use. All these relationships were indicated at the 0.05 and 0.01 level in 2 tailed.

## **Discussion**

The use of computers and anxiety was measured using a computer self-efficacy and the anxiety scales and were analysed with the collected data through the study. The main objective was to judge the level of self-confidence and anxiety in a sample of Dental undergraduates and the differences among the other related factors between the year groups.

The findings of the study indicated that health sciences students developed their self-confidence and they have indicated the low level anxiety for use of computers. The third year undergraduates have showed high computer self-efficacy. This has been proved that Compeau et al.s' (1999) idea of that the users were in higher level of computer self-efficacy, lower the computer anxiety'. In that sense the IL programme which started in the Dental Faculty would be more productive and the content would be more effective for these undergraduates. As mentioned by Ren (2000) the competency programmes are effective to enhance the student performance. The computer anxiety is another factor that measured through the study. As both year undergraduates indicated the high level of self-confidence relating to the CSES, they were in moderate level of computer anxiety (50%) which may help them to use computer properly (Chien, 2012). According to t-test it is indicated that there were no any significant difference between gender in these 2<sup>nd</sup> and 3<sup>rd</sup> year undergraduates.

Moreover, dental subjects can be taught via technology specially the courses, which offered technology literacy before enrolling to the courses that require it use. These courses would increase computer literacy and will minimize the computer anxiety consequently improving the use of technology towards learning.

Based on frequency of library usage, it is not shown significant difference between CSES, CARS, studying year, and Z-score. On the contrary, age and

gender have shown the significant differences based on frequency of library use (Durndell & Haag, 2002).

**Table 6:** Pearson Correlations between frequencies of library usage with other related factors

	<b>Year</b>	<b>Z-Score</b>	<b>Age</b>	<b>F-usage</b>	<b>CSES</b>	<b>CARS</b>	<b>Gender</b>
<b>Year</b>							
r		.205*	.622**	-.176	.308**	.194*	.109
p		.028	.000	.061	.001	.039	.249
<b>Z-Score</b>							
r	.205*		.101	.128	-.091	-.055	-.150
p	.028		.284	.175	.338	.559	.111
<b>Age</b>							
r	.622**	.101		-.053	.222*	.021	.054
p	.000	.284		.578	.018	.823	.568
<b>F-usage</b>							
r	-.176	.128	-.053		-.014	-.100	.316**
p	.061	.175	.578		.880	.292	.001
<b>CSES</b>							
r	.308**	-.091	.222*	-.014		.023	.148
p	.001	.338	.018	.880		.805	.116
<b>CARS</b>							
r	.194*	-.055	.021	-.100	.023		-.054
p	.039	.559	.823	.292	.805		.567
<b>Gender</b>							
r	.109	-.150	.054	.316**	.148	-.054	
p	.249	.111	.568	.001	.116	.567	

\*. Correlation is significant at the 0.05 level (2-tailed)

\*\*. Correlation is significant at the 0.01 level (2-tailed)

F. usage= Frequency of usage

r- Pearson Correlations

p-Sig (2 tail)

Relating to the correlation between the components in the study, strong and high correlation was indicated between studying year of the dental undergraduates. Moreover, studying year and computer self-efficacy and gender and frequency of library use also have significant correlation but not so strong. He and Freeman (2010) reported the same result that gender is not

correlated with self-efficacy. However, CARS negatively correlated with Z-Score, frequency of usage and gender of the study.

### **Implications and future research directions**

Although the main purpose of the study was to understand the self-efficacy level and anxiety level of 2<sup>nd</sup> and 3<sup>rd</sup> year dental undergraduates who followed the IL programme in the faculty, the whole dental population in Sri Lanka would have been taken for the study. This would be better for the course designers and dental library management to rethink about the content of the IL programme based on the studying year as significant differences were indicated. Moreover, by increasing the hands-on-training of the programme, it will be helpful to further reduce the computer anxiety level and to enhance the use of computers of the dental undergraduates in Sri Lanka.

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